Mar Cor Purification

CWP 100, Model H/S

Operator's Guide

MAR COR® PURIFICATION
A Cantel Medical Company

Important User Information

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The information in this document is not intended to cover all possible conditions and situations that might occur. The end user must exercise caution and common sense when installing, using, or maintaining MCP products. If any questions or problems arise, call MCP Technical Services at 1-800-633-3080.

Intended Use

MCP products are intended to be installed and used as described in this manual and other related MCP literature.

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Preface

This manual provides information needed to operate the water purification unit, CWP 100, model WRO H/S.

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PLC program version	RU0901Vx
Panel program version	RU0901Vx

CAUTION!
At delivery, the CWP unit is filled with a preservation and anti-freeze solution containing less than 1 percent formaldehyde and 10 percent glycerine. This solution must be thoroughly rinsed from the unit before the CWP unit is put into operation.

Make sure that no residual formaldehyde can be detected before connecting patients.

Safety Messages

WARNING!
Is used to alert the user **not to take** a certain action which, if done, can create a potential hazard and result in a serious adverse reaction, injury or death. A warning may also be used to alert the user **to take** a certain action to avoid the potential hazard.

CAUTION!
Is used to alert the user **to take** a certain action to protect against a potential hazard which, if ignored, can create an adverse effect on the patient or the device. A caution may also be used to alert the user **not to take** a certain action to avoid the potential hazard.

NOTE
It is a reminder to the user during normal operation for what is a suitable action in a situation.

Safety Considerations

WARNING!
Unauthorized modifications, alterations or repair of the CWP water purification unit may result in malfunctioning or have other serious consequences for the safe operation of the equipment.

WARNING!

Dialysis machines that are to be connected to the distribution loop supplied with water from a MCP CWP water purification unit must comply with IEC 60601-2-16.

CAUTION!

- The CWP water purification unit may only be operated by persons trained in this equipment and who have read and understand this *Operator's Manual*. If the CWP water purification unit does not perform as described in the *Operator's Manual*, it should not be used until the condition is rectified.
- When unpacking, check the equipment for any signs of damage. If the equipment is in any way damaged, proper operation can not be assured.
- The installation and start up of CWP water purification unit must be made by authorized personnel.
- The use of mobile telephones or communication equipment in the vicinity of the CWP water purification unit could adversely influence the performance of the machine.
- The CWP water purification unit will perform as designed only if it is used and maintained in accordance with MCP instructions. Any warranties made by MCP with respect to the CWP water purification unit are void if the equipment is not used in accordance with the instructions provided. MCP will not accept responsibility for any damage or injury resulting from improper use or maintenance or unauthorized repair.
- The user must verify the quality of the protective earth ground in the installation.
- When used as a medical device, U.S. Federal law restricts this device for sale only by the order of a physician.

List of Symbols

NOTE
All symbols in this list may not be represented on this product.

Alternating current

Protective earth (ground)

Warning, consult accompanying documents

Off (power, disconnection from the mains)

On (power, connection to the mains)

Type B, applied part

Handle with care

This way up

Keep dry

Separate collection for electrical and electronic equipment

Input /Output

Year of manufacturing

ME equipment and ME systems that include RF transmitters or that intentionally apply RF electro-magnetic energy for diagnosis or treatment shall be labeled with this symbol.

Certification Marks

The ETL mark indicates that the water purification unit, CWP 100, Model WRO H and CWP 100, Model WRO S, complies with requirements in IEC 60601-1:1988 and A1 and A2.

IPR — Intellectual Property Rights

Trademarks

WIRSBO-CLEANPEX® is a trademark of Uponor Innovation AB registered in several countries including United States, Canada, Sweden, Switzerland, Norway and the European Community.

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1 Introduction

1.1 Intended use

The MCP CWP water purification unit has been designed to meet the unique requirements of the dialysis clinic. When properly maintained it produces water of high quality both from a chemical and microbiological standpoint, provided that the inlet water (feed water) is pretreated and complies with normal standards for drinking water.

1.2 General Function

The water quality is a very important factor in achieving and maintaining an adequate quality of the dialysis fluid. The chemical and microbiological quality of the water depends not only on technical parameters such as the retention rate of membranes, but also to a large extent on proper maintenance of the equipment and the distribution loop.

The CWP unit works by the purification principle reverse osmosis (RO is an acronym for reverse osmosis) which is the preferred dialysis method for water purification. The CWP unit removes at least 95 percent of total dissolved salts and more than 99 percent of the bacteria and endotoxins from the inlet water.

1.2.1 Pretreatment

Inlet water quality must comply with paragraph 4.1.1 on page 33. The inlet water is usually pretreated with active carbon filters, softener, and a particle filter before it flows to the CWP unit. Depending on the local water quality and regulations, different pretreatment equipment may be required.

1.2.2 Distribution Loop

The product water from the CWP unit supplies the distribution loop which supplies the dialysis machines with the product water.

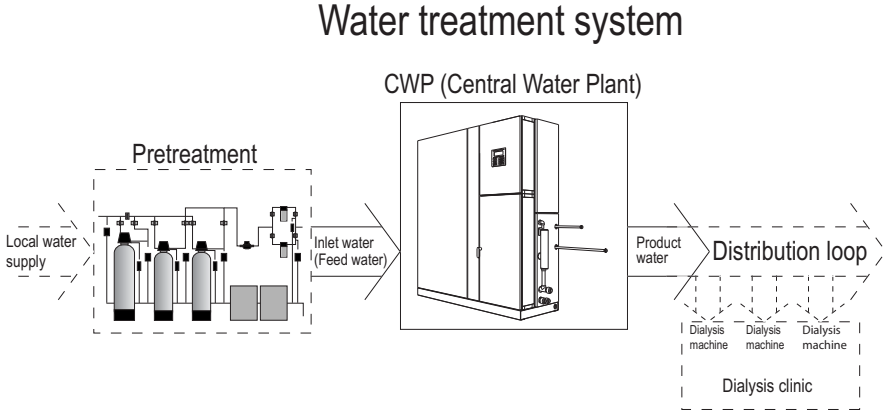

Fig.1.1 Water treatment system

1.2.3 Hot Water Circulation

The CWP unit includes a heating unit (H) for the distribution loop to minimize any form of microbiological growth and biofilm formation. Gambro® dialysis machines can be integrated in this process (integrated heat).

CAUTION!
Integration of dialysis machines other than Gambro® may cause damage to these machines. Approval must therefore first be obtained from the machine manufacturer!

1.2.4 Chemical Disinfection

To make sure that microbiological quality is maintained, the system has a semi-automatic cleaning and chemical disinfection procedure for the RO stage that keeps the membrane surfaces clean and minimizes bacterial growth.

1.3 Water quality

1.3.1 Microbiology

The microbiological quality of the dialysis fluid is a function of various factors. Neglecting any of these could result in a poor water quality.

Example of these factors are:

- Adequate inlet water quality.
- Regular and pro-active chemical disinfection of the CWP unit.
- Regular and pro-active hot water circulation of the distribution loop.
- Drain connections from the dialysis machines to the drainage system with an air gap to avoid microbial contamination.

1.3.2 Chemical Quality

To get an indication of the water quality, the CWP unit measures the conductivity of the water (expressed in microsiemens-per-cm, μS/cm). The conductivity is a measurement of the dissolved salts in the water. It should be used as an indicator of the performance of the reverse osmosis system.

CAUTION!
The water produced by the CWP unit should be analyzed on a regular basis to verify that it conforms with applicable regulations or standards for water for dialysis.

NOTE

The conductivity value does not always indicate the suitability of the water for dialysis. For example, aluminium may be present in concentrations exceeding recommended standards without affecting the conductivity.

The quality of the water, used for dialysis, must be verified by regular water analyses.

WARNING!

This device does not remove chlorine and chloramines. Carbon filtration of the inlet water to remove these substances is required prior to operation of this device. Severe patient injury may otherwise occur. Before each patient shift, the level of total chlorine must be monitored in the feed water to the CWP unit. The level should not exceed 0.1 ppm.

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2 Operation

2.1 Operator Panel

The CWP unit is operated with the buttons on the operator panel. It displays alarm information and allows entering parameters and data.

For more detailed information refer to the *Service Manual*.

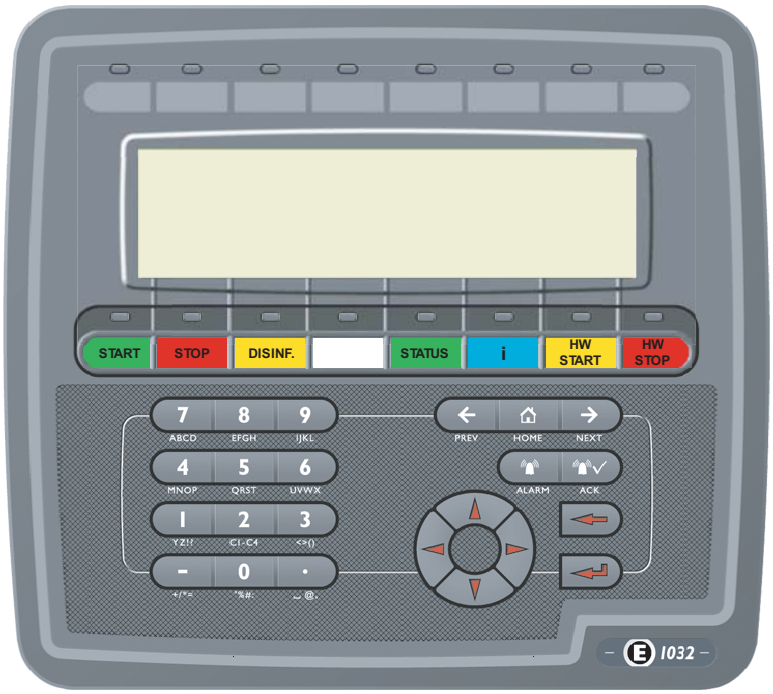
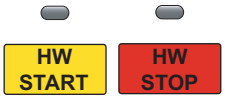
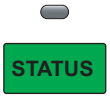
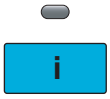


Fig.2.1 Operator panel

2.1.1 Operator Panel Description

Button	Action	Comment
START	Initiates CWP unit start cycle	• During the start cycle, **START UP** displays, a 5 minute flush-to-drain takes place, followed by a 30 second conductivity check. • If the conductivity value is too high, the flush-to-drain continues. • To shorten the start cycle, the five minute flush-to-drain can be shortened to five seconds by keeping START pressed during the initial flush-to-drain until the display reads **0 MIN**[1]. • The display shows **RAPID**.
		• If hot water circulation has been performed during the start cycle, **START UP** displays and the start cycle extends a minimum of ten minutes. • The water diverts to the HW tank until the temperature in the return line from the distribution loop is below 28 °C.
	Starts rinse during chemical disinfection cycle	The chemical disinfection cycle can be interrupted at any time and a rinse cycle initiated by pressing STOP and then pressing START for five seconds or until **RINSE** or **TEST POSITION** appears on the display.
STOP	Stops the CWP	Initiates standby mode.
	Pauses the chemical disinfection cycle.	• The CWP unit stops and **STOPPED** flashes in the display. • Disinfection cycle resumes by pressing DISINF..
	Arrow buttons	Moves the cursor on the display.
	Number buttons (key pad)	Permits entering codes and parameters during programming.
	Enter button	• Confirms entered information • Also used to perform commands. • Displays setting ranges if pressed without first entering a value.

Button	Action	Comment
	Starts chemical disinfection cycle.	• Remaining time shows on the display. • **STOPPED** displays if the cycle is interrupted. • To continue the chemical disinfection cycle, press DISINF.
	Starts and stops hot water circulation	For further information refer to paragraph 2.3.2 on page 22.
	Status information displays	
	These buttons are used in alarm situations	For further information refer to paragraph 5.2 on page 40.
	Clear button	Erase unwanted data during programming.
	Information button	This button is enabled when a display text in reverse type occurs just above the button. The display text indicates the present function of the button.
	Show main menu	• Allows access to detailed information of the CWP unit. • For further information, refer to paragraph 6.2.1 on page 49.
	Goes to previous menu in the program	
	Goes forward to the next menu	This function is only available after has been used.

1. This function should only be used at accidental interruptions of the operation.

2.1.2 Button Descriptions

Panel Button	Indication[1]	Description
	Steady light	The CWP unit is in operation mode
	Light off	The CWP unit is in stand by mode
	Blinking light	• The CWP unit not ready for operation. • Time stop operation. • Post run mode

Panel Button	Indication[1]	Description
HW START	Steady light	The hot water circulation in the distribution loop is in progress.
	Light off	There is no hot water circulation in the distribution loop.
	Blinking light	Hot water circulation initiated but is paused for safety reasons.
DISINF.	Steady light	Chemical disinfection is in progress.
	Light off	There is no chemical disinfection in progress.
	Blinking light	Chemical disinfection is finished, but the residual test has not been performed and verified by entering operator code.

1. Refer to paragraph 2.2.2 on page 20.

2.2 Operating Instructions

Starting and stopping the operation and hot water circulation can be automated. Setting the automatic starting and stopping is done at installation according to operating schedule for the specific clinic. No general rules can be given — specific settings depend upon local rules, regulations, and operating schedules.

The following paragraphs describe the instructions to operate the CWP unit. Refer to paragraph 6.1 on page 45 for appropriate settings.

The status-indicating lights described in the instructions are only available with the optional lamp indication unit. Refer to paragraph 2.2.2 on page 20.

2.2.1 Operating Modes

2.2.1.1 Local Mode

The CWP unit operates locally at the operator panel.

Operation		Mode	Description
LOCAL	Operated through the operator panel on the CWP unit. START, STOP, HW START, and HW STOP are enabled.	**MAN**	All start and stop actions are performed manually.
		AUT	• Start actions begin automatically according to preset time channels (refer to the *Service Manual*). • Stop actions are preset (by a service technician) to manually (by pressing button) or to automatic (by **TIME CHANNELS**). • For other options, refer paragraph 2.6 on page 27.

2.2.1.2 Panel Display Indications

Display indications that appear are described in the following table.

Display Indication	Description
>>------>	Indicates that **POST RUN** is activate, refer to paragraph 2.6 on page 27. The number of markers between the arrows indicates how much time the Post run mode remains (At start six markers is shown).
OPERATION->	The symbol **->** indicates that CWP unit must be stopped by a manual action.
+	Indicates that more information is available. Use arrow down button to scroll.

Fig.2.2 The CWP unit optional lamp indication unit

2.2.2 Lamp Indication Unit (option)

The CWP unit can be supplied with a lamp indication unit which should be placed at a visible location in the clinic. The lamp indication unit displays continuous status information for the CWP unit, including both A and B level alarms.

2.2.2.1 Lamp Indications

Lamp Indication		Seconds	Description
Green Light	Steady light		The CWP unit is in normal operation.
	Blinking Light	0.5 on 0.5 off	• Indicates that the CWP unit is not ready to operate. • It occurs during start up when the CWP unit is flushing-to-drain or when hot water is displaced from the distribution loop.
	Blinking Light	2 on 0.5 off	• Indicates a time stop operation. • It alerts the operator when an operation is to be terminated — the green lamp starts to blink at end of the time channel period. • The buzzer sounds when green lamp is not lit, provided that buzzer operation is set to **YES**[1].
	Blinking Light	4 on 0.1 off	• Indicates post run mode. • A counter for delayed finish of the operation displays the set time (in this counter) when post run is activated. • Dialysis should not proceed during post run. • Refer to paragraph 2.6 on page 27

Lamp Indication		Seconds	Description
Yellow Light	Steady Light		The hot water circulation of the distribution loop is running.
	Blinking Light	0.5 on 0.5 off	• When initiating hot water circulation of the distribution loop by turning the key in the remote control box to **HEAT** or by autostart (**`TIME CHANNELS`** or post run, refer to the *Service Manual*), the start of the pump in the HW unit is delayed 30 seconds (Three minutes extended delay directly after operation stop). • This is indicated by a blinking yellow light.
White Light	Steady Light		Chemical disinfection is in progress.
	Blinking Light	0.5 on 0.5 off	Chemical disinfection is finished, but the residual test has not yet been performed and verified by entering the operator code.
Orange Light	Steady Light		The B-alarm has been acknowledged, but the cause of the alarm still remains.
	Blinking Light	0.5 on 0.5 off	B-alarm has occurred. Refer to paragraph 5.2 on page 40.
Red Light	Steady Light		The A-alarm has been acknowledged, but the cause of the alarm still remains.
	Blinking Light	0.5 on 0.5 off	A-alarm has occurred. Refer to paragraph 5.2 on page 40

1. In cases where an external alarm central is installed, the signal must be delayed at least 1 second in the alarm central. An alarm is otherwise issued when the buzzer signal is active.

2.2.2.2 Alarm Types

Alarm	Description
A-alarm	Indicates that prompt operator response is required — this signal also activates a buzzer and a contact for an external alarm in a central system.
B-alarm	Indicates that operators awareness is required, no buzzer and no contact for external alarm is activated

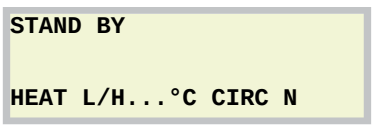
2.3 Operating in Local-Manual Mode

2.3.1 Manual Operation Start

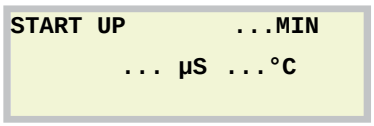
2.3.1.1 Manual Start

To start when chemical disinfection has not been performed, do as follows.

Step 1 If hot water circulation is running. Press HW STOP (this stops hot water circulation).

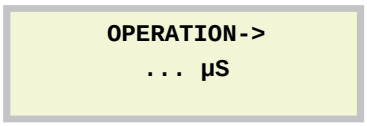


Step 2 Press START.



a The CWP unit starts with a flush-to-drain (5 minutes), if hot water circulation has been enabled.

b Flush of the distribution loop (10 minutes) follows, draining the hot water (**START UP** displays and the optional lamp indication unit shows a green blinking lamp).



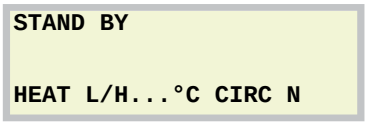
Step 3 The dialysis machines can be started when **OPERATION** displays (green lamp turns to a steady light).

CAUTION!
Do not start the dialysis machines until **OPERATION** displays and the green lamp turns to a steady light. Failure to comply with this caution message can allow hot water to enter the dialysis machines resulting in serious injury.

2.3.1.2 Manual Stop

To stop the operation, do as follows.

Press STOP.



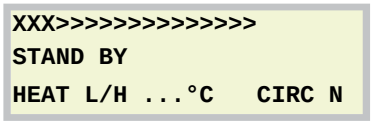
NOTE
When in **STAND BY,** the CWP unit will flush-to-drain at regular intervals.

2.3.2 Manual Hot Water Circulation

2.3.2.1 Start Hot Water Circulation

CAUTION!
Dialysis machines that are not designed to handle hot water must be disconnected from the distribution loop.

Step 1 Make sure that the cursor is positioned in the upper left corner of the display. and enter the operator code and press ↵.



Step 2 Press HW START to initiate hot water circulation — the yellow lamp blinks. After a 3 minute delay the hot water circulation of the distribution loop starts and yellow lamp goes to steady light.

```
STAND BY
HEAT L/H ...°C   CIRC Y
```

2.3.2.2 Stop Hot Water Circulation

To stop hot water circulation, do as follows.

Press HW STOP.

```
STAND BY

HEAT L/H...°C CIRC N
```

2.4 Operating in Local-Autostart Mode

In the local-autostart mode, the CWP unit uses settings in time channels which are entered by technical personnel following the clinic requirements.

2.4.1 Starting in Autostart

If the autostart function has been selected, hot water circulation will stop and the CWP unit starts as programmed in **TIME CHANNELS**. Refer to the *Service Manual*.

The CWP unit starts with:

Step 1 Flush-to-drain (5 minutes)

Step 2 Flush of the distribution loop removing hot water (**START UP** displays and the optional lamp indication unit green lamp blinks).

The dialysis machines can be started when the display shows **OPERATION** and the green lamp goes to a steady light.

To run **OPERATION** outside time channels settings press START.

CAUTION!
Do not start the dialysis machines until the display shows **OPERATION** (green lamp goes to steady light). Hot water may otherwise enter the dialysis machines inadvertently.

2.4.2 Autostop

Autostop is performed if **STOP OPERATION** is set to **AUT** and times are programmed in the **TIME CHANNELS**. Refer to the *Service Manual*.

The **->** symbol indicates that the CWP unit has to be stopped manually.

To manually stop in autostop, press STOP to enter standby mode.

NOTE
When in **STAND BY** mode, the machine will perform a flush-to-drain at regular intervals.

2.4.3 Hot Water Circulation

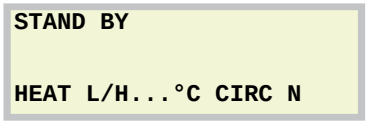
Hot water circulation starts automatically if it is programmed in **TIME CHANNELS**. Refer to the *Service Manual*.

To run hot water circulation outside **TIME CHANNELS** settings, enter the operator code and press HW START.

2.4.4 Autostop Hot Water Circulation

Autostop is performed if **STOP HW-CIRC** is set to **AUT** and times are programmed in the **TIME CHANNELS**. Refer the *Service Manual*.

To manually stop hot water circulation and enter standby, press HW STOP.



CAUTION!
Disconnect the dialysis machines from the distribution loop if the dialysis machines are not designed to handle hot water.

2.5 Chemical Disinfection

2.5.1 Local

2.5.1.1 Start Chemical Disinfection

Step 1 If the CWP unit is in operation, stop the operation according to selected mode of operation previously described.

Step 2 Enter the operator code and press ↵ (is not required if hot water circulation has just been initiated from the panel).

Step 3 Press DISINF..

Step 4 Press DISINF. again if chemical disinfection is to be performed.

```
DISINF.???
No = Press STOP
Yes = Press DISINF.
```

Step 5 Open the front door on the CWP unit and move the dosing connector to **DISINFECTION**. Do this by twisting counterclockwise and pulling the connector outward. Then move it to the disinfect port, inserting the connector and turning it clockwise. Close the door.

```
DISINF.???
Move dos.connector
and press DISINF.
```

```
DISINF.???


HEAT L/H ..°C CIRC Y
```

Step 6 Press DISINF..

The CWP unit performs a chemical disinfection procedure lasting for 132 minutes (factory setting). Time remaining for chemical disinfection displays continuously.

NOTE
The chemical disinfection procedure starts and ends with a 6 minute valve test sequence. During this operation the hot water circulation stops.

2.5.2 Pause Chemical Disinfection

The chemical disinfection can be paused by pressing STOP. The remaining time for the chemical disinfection procedure displays and starts decreasing again when DISINF. is pressed.

CAUTION!
Extended exposure of membranes to peracetic acid will negatively affect the membrane.

2.5.3 Start After Chemical Disinfection

Step 1 Open the front door on the CWP unit and move the dosing connector to **OPERATION** by twisting the connector counterclockwise and pulling it outward. Then move to the operation port, insert, and turn clockwise.

```
DISINF. FINISHED
Move dos.connector
```

Step 2 Press START. This initiates a flush-to-drain.

```
TEST POSITION
Test= press START
Accept = dial code XXX
```

Step 3 After approximately one minute, collect a water sample from the drain funnel on the right hand side of the CWP unit.

```
TEST OPERATION     ...µS
Test water
Press STOP
```

a Verify with a separate test that no residual disinfectant can be detected in the water.

b Press STOP.

WARNING!
Do not connect patients until a test for residual disinfectants has been performed!

Step 4 Make sure that the cursor is positioned after **DIAL CODE**. Enter the operator code and press ↵ and the CWP unit enters standby mode.

```
TEST POSITION
Test= press START
Accept = dial code XXX
```

Step 5 Start begins as previously described, depending on the CWP unit set up mode. Refer to paragraph 2.2.1 on page 19.

Step 6 Mark the fluid level and the date on the disinfectant container with a permanent marker.

CAUTION!
Do not start the dialysis machines until the display shows **OPERATION** (green lamp goes to steady light). Disinfectant may otherwise enter the machines inadvertently.

2.6 Post Run

2.6.1 Post Run with Stop

- This feature delays stopping as set in **TIME CHANNELS**.

2.6.2 Post Run with Hot Water Circulation

- This feature delays stopping the operation as set in **TIME CHANNELS** and starting hot water circulation.
- To view the post run settings refer to the *Service Manual*. The default setting from the factory is post run disabled.
- The post run function can be used in local and remote modes.

2.6.3 Local Mode

2.6.3.1 Activate Post Run with Stop

Step 1 When in operation, use the arrow buttons to scroll down to **POST RUN**, enter the operator code and press ↵.

Step 2 Keep START pressed until an arrow (**>>------>**) appears on the display.

Step 3 Finishing operation will be delayed (one hour factory setting) with the time set in post run counter.

2.6.3.2 Activate Post Run with Hot Water Circulation

Step 1 When in operation, use the arrow buttons to scroll down to **POST RUN**, enter the operator code and press ↵.

Step 2 Keep HW START depressed until an arrow (**>>------>**) appears on the display.

Step 3 Hot water circulation starts when operation stops (factory setting one hour).

2.6.3.3 Deactivate Post Run

Step 1 Use arrow buttons to scroll down to **POST RUN**.

Step 2 Enter the operator code and press ↵.

Step 3 Press START until the arrow disappears (approximately 15 seconds).

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3 Regular Maintenance

3.1 Water Sample

The quality of the water must be checked by water analysis on a regular basis.

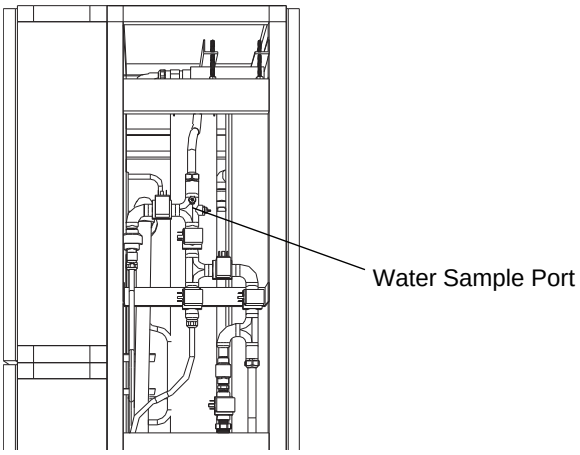

Fig.3.1 Water sample port

3.1.1 Collecting a Water Sample

To avoid damaging the silicone insert, don't use needles other than TERUMO® 23G x 1 inch 0.6 x 25 nr 16 LUER.

Step 1 Clean the needle and the sample port with alcohol.

Step 2 Insert the needle through the silicone sample port.

Step 3 Collect water.

3.2 Chemical Disinfection

Chemical disinfection ensures a high microbiological water quality. To run this procedure refer to paragraph 2.5.1.1 on page 25.

WARNING!
Chemical disinfectants are toxic. Users must read and understand all precautions regarding chemical disinfectents and the chemical disinfection process. Failure to observe this warning can result in serious injury!

3.2.1 Frequency

Disinfection must be performed on a regular basis to ensure consistent microbiological quality of the product water. The required frequency depends on factors such as inlet water quality and operation schedule and should be determined by regular microbiological testing. Disinfecction once a week is a minimum.

3.3 Changing Solution Containers

If the solution container empties during a disinfection cycle a B-alarm (**`9.LOW LEVEL CHEMICALS`**) occurs — the dosing pump stops but the program continues. A new chemical disinfection cycle cannot be initiated until the container is replaced.

3.3.1 To Change Container

CAUTION!
Use protective eye wear and rubber gloves! Failure to comply with this caution can result in serious injury!

Step 1 Open the front door and remove the pickup tube from the empty container.

Step 2 Remove the empty container and replace it with a filled container.

Step 3 Unscrew the cap on the filled container.

Step 4 Extend the pickup tube by pulling it apart at the top and bottom.

Step 5 Place the pickup tube into the filled container and push it downward until the cap meets the container top.

Step 6 Close the front door.

3.3.2 Disinfectant Amount

The recommended amounts of disinfectant for each chemical disinfection cycle are listed below (MINNCARE® has been used as an example below):

WARNING!
Peracetic acid concentrates are very corrosive and can damage eyes and skin.
Study the manufacturer safety instructions prior to use.
Use protective eye wear!
Exposed skin will be irritated and white spots may appear which, however, disappears after 1-2 hours.
In case of spillage, flush with plenty of water.

CAUTION!
Incorrect concentrations of peracetic acid will cause irreversible damage to the reverse osmosis membranes! Damage will also occur if the temperature of the diluted disinfection solution that is circulated in the CWP unit exceeds 25 °C. Consult MCP if any doubts exist!

3.3.3 Required Disinfectant Amount

Model Size	MINNCARE® ml/cycle
101	300
102	400
103	500
104	600
106	750

3.3.4 Stopping Chemical Disinfection

Disinfection Phase[1]	To interrupt chemical disinfection press START for 5 seconds to initiate actions described below.	To continue chemical disinfection press DISINF. to initiate actions described below.
Valve test 1 (before chemical disinfection)	The CWP unit goes into residual test after chemical disinfection.	Valve test restarts. The chemical disinfection procedure then continues.
Proportioning and circulation disinfectant	The CWP unit goes into rinse (90 minutes) and then to test after chemical disinfection.	Disinfection procedure continues from where it was before the stop.
Rinse	Rinse continues from where it was before the stop.	Rinse continues from where it was before the stop.
Valve test 2 (after chemical disinfection)	In case of low level inlet or flow alarm the CWP unit goes into residual test after chemical disinfection. *NOTE* Loop test will be required, refer to the *Service Manual.* Other alarms or manual stop, Valve test 2 restarts	Valve test 2 restarts.

1. Only shown if **`DETAILED DISPLAY`** has been selected. Refer to paragraph 6.2 on page 49.

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4 Technical Data

The following paragraphs and tables contain performance data and specifications for the CWP 100, model WRO H/S.

4.1 Performance and Specifications

4.1.1 Product Water

	Specifications					
Minimum Outlet Capacity, liter/min	**Model**	**101**	**102**	**103**	**104**	**106**
	+5 °C	8	14	19	23	30
	+10 °C	9	16	21	25	32
	+15 °C	11	18	23	27	35
	+20 °C	13	20	25	29	35
		(l/min at a product water outlet pressure of 0.2 MPa/29 psi)				
Quality	• Depends on inlet water quality. If potable water is used and the system is properly maintained, the following rejection rates will be obtained: • Total dissolved salts: >95% • Bacteria (CFU) and endotoxins (EU): >99% • Water conversion factor max. 75%					

4.1.2 Water Supply

	Specifications					
	Model	**101**	**102**	**103**	**104**	**106**
Min. input	**l/min**	20	30	40	50	60
Min. input pressure (to the WRO)	**MPa**	0.1	0.1	0.15	0.25	0.35
	psi	15	15	22	36	51
Max. input pressure (to the WRO)	**MPa**	0.5 (all models)				
	psi	73 (all models)				
Temperature	+5 °C to +25 °C [1]					
Quality	Potable water should be used. Additional pretreatment is normally necessary. Membrane and machine life expectancy depends on inlet water quality. It is recommended not to operate the CWP outside the following limits.					
Hardness	<17.85 mg/L or <1.04 gpg					
Iron	<0.1 mg/L					
Manganese	<0.1 mg/L					
Chloride	<100 mg/L					

	Specifications
Silica	<25 mg/L
Total dissolved salts	<1500 mg/L
Chlorine	<0.1 mg/L
Fouling index (S.D.I.)	<5

1. Maximum +20 °C if peracetic acid is used for chemical disinfection.

4.1.3 Drain Requirements

	Specifications					
Required capacity	**Model**	**101**	**102**	**103**	**104**	**106**
	l/min	20	30	40	50	60

4.1.4 Service Connections

	Specifications
Inlet	PVC/PP female union, fits to pipe OD 25 mm
Drain from heating tank	PP female union, fits to pipe OD 32 mm (heat resistant)
Drain from RO-unit	PP/PVC female union, fits to pipe OD 32 mm
Drain from tray	1/2 inch female thread
Product water outlet & return	3/4 inch female thread

4.1.5 Membranes

	Specifications
Membrane material	Modified polyamide, thin film composite
Membrane configuration	Spiral wound
pH-tolerance	2 to 11

4.1.6 Power Supply

	Specifications	
Mains voltage	208/120 V, 60 Hz, three-phase (five wires) Refer to name plate on the CWP unit for correct information	
Power rating with 3x208 VAC, 60 Hz	RO-unit	2.5 kW (model 101-104, 106)
	Heating unit	9.0 kW (model 101 - 104, 106)
Fuse for units with 3x208 VAC, 60 Hz	16 AT + 32 AT, 16 AT (SLO-BLO) or 40 AT (SLO-BLO), if powered from one supply	

4.1.7 Measurement Ranges

	Specifications	
Temperature	0 to 100 °C (±10%)	
Flow	**Inlet water**	3 to 60 l/min (±10%)
	Reject flow	0.2 to 15 l/min (±10%)
	Return water flow	• 0.2 to 20 l/min (±10%), (model 101-102) • 3 to 60 l/min (±10%) (model 103-104, 106)
Conductivity	**Inlet water**	100 to 1000 µS/cm (±15%)
	Product water	2 to 200 µS/cm (±15% or ±1,5 µS/cm, if <=10 µS/cm)

4.1.8 Logging Interface

	Specifications
Interface	RS232, 9 pin male according to EIA RS-232-C with crossover adapter
Max input Voltage	±15 VDC
High Level min output	+5 VDC
Low level min output	-5 VDC
Max Current	±5 mA

4.2 Physical Data

4.2.1 Dimensions

	Specifications					
Measures	**Model**	**101**	**102**	**103**	**104**	**106**
	Depth[1], inch	26-3/8	26-3/8	26-3/8	26-3/8	26-3/8
	Width, inch	67-3/4	75-1/4	75-1/4	82-11/16	82-11/16
	Height, inch	79-3/16	79-3/16	79-3/16	79-3/16	79-3/16
		19-13/16 inch extra space is required on both sides of the unit.				

1. Including handle, 1.57 inch

4.2.2 Heating Tank

	Specifications					
	Model	**101**	**102**	**103**	**104**	**106**
Volume	**Liters**	260	330	330	330	330

4.2.3 Weight

	Specifications					
	Model	**101**	**102**	**103**	**104**	**106**
Unit	**pounds**	1014	1113	1135	1224	1290
Unit plus packing	**pounds**	1466	1665	1687	1819	1885
Operation	**pounds**	1709	1995	2028	2127	2216

4.3 Environmental Data

4.3.1 Ambient Temperature

	Specifications
Shipping and Storage	-10 °C to +40 °C
Operation	+5 C to +35 °C

4.4 Safety

	Specifications
Electrical Shock I, type B	IEC 60601-1
Electromagnetic Culpability	IEC 60601-1-2

The information herein may be subject to change without further notice.

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5 Troubleshooting

5.1 Alarm Information

5.1.1 Power Failure

- In case of a power failure, the CWP unit will stop with a blank display.
- The external alarm contact can be used to generate an alarm indication.

5.1.1.1 During Operation

- When power is restored, the CWP unit will restart and return to operation after 45 seconds (after the conductivity check finishes).

5.1.1.2 During Standby or Chemical Disinfection

- When power is restored, the CWP restarts and resumes from the stop point in the program.
- Data is retained in the program memory.

5.1.2 Water Supply Interruption

5.1.2.1 During Operation

- The CWP unit stops and **`1 LOW LEVEL INLET`**. alarm displays.
- The CWP unit attempts four restarts at one minute intervals.

5.1.2.2 Restart Successful

- If the water supply is restored and a restart is successful, the CWP unit returns to operation.
- The alarm will remain in the alarm list (**$**) and must be acknowledged manually.

5.1.2.3 Restart Attempts Fail

- If all restart attempts fail because the water supply is not restored, the CWP unit stops.
- It must be restarted manually after resetting of the alarm.

5.1.2.4 During Standby Flushing

- No alarm is issued.
- The flushing stops.
- A new flushing cycle starts at preprogram intervals (120 minutes), if there is water in the inlet tank.

5.1.2.5 During Chemical Disinfection

- No alarm is issued.
- The text **`LOW LEVEL`** will appear on the display.
- The CWP unit will try to start at preprogram intervals (30 minutes).

5.1.3 Flow Alarms

The flow rates in the system are monitored to ensure safe and trouble free operation. Some of the flow limits are specific for the size of the CWP unit and are programmed into the system.

5.2 Restoring Alarms

If an alarm occurs on the CWP unit, the A-alarm or B-alarm lamp on the external lamp indication unit flashes. For an A-alarm, the buzzer sounds. An alarm symbol displays in the upper right corner of operator display on the CWP unit. The table on the following page describes the alarms that can be reset by the operator. Other alarms require technical assistance.

5.2.1 To Reset an Alarm

Step 1 In the dialysis clinic**,** silence the audible alarm by pressing the green button on the buzzer unit.

Step 2 On the CWP unit**,** press . A list of alarms that have occurred displays with the latest alarm at the top of the list. The icon ***** in front of an alarm indicates an alarm that has not been acknowledged.

The following icons on the display have the following functions:

- **+** — Zoom function.
- **TIME** — Show or hide date and time.
- **EXIT** — Exit the alarm list.

By pressing the button below **TIME** one, two or three times, three alarm date and time options, called S, A and E, are shown. S, A or E precede the date and time on the display. Pressing the button a fourth time hides the date and time.

S	Press the button once.	• Shows the date and time when the alarm was issued. • For repeated alarms: shows the date and time when the alarm was issued for the first time.
A	Press the button twice.	• Shows the date and time when the alarm was acknowledged.
E	Press the button three times.	• Shows the date and time when the alarm became inactive. • For repeated alarms: shows the date and time when the alarm became inactive for the last time.

Step 3 To acknowledge the alarm, insure that the cursor on the alarm list points at the alarm to be acknowledged (***** in front of the alarm). If not move the cursor with the arrow buttons and press . Then ***** will disappear and the alarm light on the external lamp unit goes from flashing to a steady light. If the fault still remains, **-** showns after acknowledgement.

A **$** indicates an alarm that is no longer active but has not been acknowledged.

- If the alarm is listed in the table below, follow recommendations to correct the fault. If the alarm is not listed, call for technical assistance. For a complete alarm list and trouble shooting guide, please refer to the *Service Manual*.
- In some cases consecutive alarms may occur. It is important to acknowledge all alarms. Use the arrow buttons to find all alarms and take action.

Step 4 When the fault has been restored, press STATUS to return to normal display.

Step 5 If in a chemical disinfection cycle, and it is to be continued, press DISINF. . If chemical disinfection is to be finished as soon as possible press STOP and then keep START pressed for more than 5 seconds. A rinse procedure will initiate (**RINSE** on the display) which may last for up to 90 minutes.

Step 6 After rinse, proceed with the normal steps after chemical disinfection.

5.3 Alarm List

No	Cause	Action
1	**LOW LEVEL INLET.** (A-alarm) Low level in the inlet water tank inside the CWP unit. This alarm may be caused by plugged prefilters or insufficient water supply.	• The CWP unit will reset the alarm (indicated by **$** in the alarm list) and make up to 4 restart attempts. If an attempt is successful, the CWP unit will continue in operation. • During restart attempts, check that the inlet pressure to the CWP unit is according to paragraph 4 on page 33. • Call for technical assistance to investigate the reason for the insufficient water supply.

No	Cause	Action
4	**DOS.CONNECTOR ERROR** (B-alarm) The sensors for the connector for disinfectant indicates incorrect position.	• Open the front door of the CWP unit and check the position of the dosing connector. Make sure that it is firmly in the correct position. • Call for technical assistance if the alarm cannot be rectified.
5	**WARNING COND.** (A-alarm) The product water conductivity is elevated but still within safe limits.	• The CWP unit will continue in operation. • Call for technical assistance to find out the reason for the alarm.
6	**HIGH COND.** (A-alarm) The high conductivity alarm limit for the product water has been exceeded. The product water divert to drain through the funnel on the right hand side of the CWP unit.	• Immediately check that the product water goes to drain through the funnel on the CWP unit. If not, press STOP to stop operation. Immediately call for technical assistance. • Consult the Medical Director about further actions. • Operation will be resumed automatically if the conductivity goes below 50% of the set limit for high conductivity.
9	**LOW LEVEL CHEMICALS** (B-alarm) The container goes empty during the chemical disinfection cycle or is empty when a new cycle is to be initiated.	• At the initiation of a chemical disinfection cycle, replace the empty container. • After a chemical disinfection cycle, continue according to normal routines but replace the empty container with a filled one before next chemical disinfection cycle.
11	**DIS.TEMP LOW** (B-alarm) The acceptance temperature in the return line from the clinic has not been reached during the previous hot water circulation period.	Proceed according to normal routines but call for technical assistance to investigate the cause of the alarm.
14	**LOW LEVEL HW** (A-alarm) The water level in the HW tank is below the low level switch.	• Check that no water leakage has occurred in the clinic. • Start the CWP unit according to normal routines. • Then call for technical assistance to investigate the cause of the alarm.
31	**COND.MEASURING** (B-alarm) This alarm indicates an error in the conductivity measuring circuit for the product water (This circuit is dynamically tested at start up).	• Check the conductivity reading on the display. • If the conductivity is within the normal range, acknowledge the alarm and continue according to normal routines. • Then call for technical assistance to investigate the cause of the alarm.

No	Cause	Action
15	**MOTORPROTECTOR HW** (A-alarm)	• These alarms are of a technical nature and do not effect normal operation of the CWP unit. Dialysis can therefore be performed. • Acknowledge the alarm and continue according to normal routines. • Call for technical assistance to investigate the cause of the alarm.
27	**BATTERY LOW PLC** (internal alarm)	
28	**HW-TANK TEMP ERROR** (A-alarm)	
29	**HW-RET.TEMP ERROR** (A-alarm)	

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6 Appendix

6.1 Appendix 1 — Operating Instructions

For complete operating instructions, refer to *Chapter 2 Operation*. These instructions should only be considered as a helpful complement to the complete operating instruction.

To run the system automatically, data following the operating schedule for the specific clinic is entered into **TIME CHANNELS** at installation. No general rules can be given — differences may occur depending upon local rules, regulations and operating schedules. An operating schedule example is shown below.

Example	
Operation	Monday to Friday 8.00 to 16.30. Start and stop of operation is automatic as set in the **TIME CHANNELS**.
Disinfection	Once a week on the CWP unit. Initiated manually by the operator.
Hot Water Circulation	Every day after operation is finished. Start and stop of hot water circulation is automatic as set in the **TIME CHANNELS**.

6.1.1 Local Auto with Autostop

Evening	Morning
Normal Evening	**Normal Morning***
1 No action is required. The unit stops and the hot water circulation as set in **`TIME CHANNELS`**.	**1** No action is required. The hot water circulation stops and the unit enters the mode as set in **`TIME CHANNELS`**.
NOTE If post run is selected refer to paragraph 6.1.3 on page 48.	
Evening for Chemical Disinfection	**Morning After Chemical Disinfection**
1 If running, stop the unit by pressing STOP.	White lamp flashes.
2 Dial operator code and then press ↵.	**Test After Chemical Disinfection**
3 Press DISINF.	**1** Open the front door, move the connector to **OPERATION,** and press START. This initiates an extra rinse cycle.
4 Press DISINF. again. White lamp lights.	**2** After one minute, verify with an appropriate test strip that the water in the funnel on the right hand side contains no disinfectant. If the test is positive, let the flush continue for 5 minutes and then test again. Repeat this cycle until the test is negative.
5 Open the front door and move the dosing connector to **DISINFECTION**.	
⚠ *CAUTION!* Read the safety instructions for the chemical disinfectant. Use protective glasses and rubber gloves!	⚠ *WARNING!* Do not initiate dialysis until the water has been tested for residual disinfectants.
6 Press once again DISINF. Chemical disinfection starts.	**3** Press STOP.
	4 Enter the operator code and then press ↵. The CWP unit enters the mode set in **`TIME CHANNELS`**.
	5 Mark the fluid level and date on the disinfectant container with a permanent marker.

6.1.2 Local Auto with Manual Stop

Evening	Morning
Normal Evening	**Normal morning***
1 Press STOP. The CWP unit starts hot water circulation as set in **TIME CHANNELS**.	**1** No action required. (The Hot water circulation will stop and the operation will be entered according to preset times in Time channels)
NOTE If post run is to be selected refer to paragraph 6.1.3 on page 48.	
Evening for Chemical Disinfection	**Morning After Chemical Disinfection**
1 If running, stop the unit by pressing STOP.	White lamp flashes.
2 Enter the operator code and press ↵.	**Test After Chemical Disinfection**
3 Press DISINF..	**1** Open the front door, move the connector to **OPERATION,** and press START. This initiates an extra rinse cycle.
4 Press DISINF. again. The white lamp lights.	
5 Open the front door and move the dosing connector to **DISINFECTION**.	**2** After one minute, verify with an appropriate test strip that the water in the funnel on the right hand side contains no disinfectant. If the test is positive, let the flush continue for 5 minutes and then test again. Repeat this cycle until the test is negative.
⚠ *CAUTION!* Read the safety instructions for the chemical disinfectant. Use protective glasses and rubber gloves!	⚠ *WARNING!* Do not initiate dialysis until the water has been tested for residual disinfectants.
6 Press DISINF.. Chemical disinfection starts.	**3** Press STOP.
	4 Enter the operator code and then press ↵. The CWP unit enters a mode as set in **TIME CHANNELS**.
	5 Mark the fluid level and date on the disinfectant container with a permanent marker.

6.1.3 Local Post Run

6.1.3.1 Activate Post Run at Operator Panel

Post Run, Activate	
Alternative 1— Delayed stop	
1a	When in operation use arrow buttons to scroll down to **POST RUN.**
b	Enter operator code and press ↵.
c	Then keep START pressed (min 3 sec.) until an arrow (**>>------>**) appears on the display.
d	Operation will be finished after 1 hour (factory setting).
Alternative 2 — Delayed stop and start hot water circulation	
2a	When in operation use the arrow buttons to scroll down to **POST RUN**.
b	Dial operator code and press ↵.
c	Then keep HW START pressed until an arrow (**>>------>**) appears on the display.
d	Hot water circulation is automatically initiated when operation stops (factory setting one hour).

6.1.3.2 Turn Off Post Run at Operator Panel

Post Run, Deactivate	
Alternative 1— Delayed stop	
1a	Use arrow buttons to scroll down to **POST RUN**.
b	Enter operator code and press ↵.
c	Then keep START pressed until the arrow (**>>------>**) disappears.
Alternative 2 — Delayed stop and start hot water circulation	
2a	Use arrow buttons to scroll down to **POST RUN**.
b	Enter operator code and press ↵.
	Then keep START depressed (min 15 sec.) until the arrow (**>>------>**) disappears on the display.

6.2 Appendix 2 — Advanced Handling

Handling that requires technician code 1 may only be done by authorized personnel.

6.2.1 Main Menu

The allows access to more detailed information about the CWP. It also gives access for the operator to disengage the water saving control system if required.

Pressing this button brings up the display shown below. To make a selection, place the cursor in front of respective option and then press ↵.

Shown in display	Description
TH 02-10-24 13:05:00	Present time (day, date, time)
CWP INFO LOCAL/ REMOTE	Shows if the CWP unit is in local or remote / **AUT** or **MAN** control. The information displayed under this menu is shown in table below.
TECHNICIAN INFO	Will give technical information about the CWP unit. Refer to *Service Manual* for more information.
TEST OPERATION XXX	It will start the CWP unit and let it run for 20 minutes with all product water being diverted to drain. This mode is useful in service situations. To initiate test operation, enter the operator code and press ↵.
REJECT CONTROL XXX **AUT (AUT)**	**Reject control (water saving)** **AUT** - Normal position. The water saving control system follows what is set in the technical level, Refer to service and maintenance for more information. **MAN** - The water saving control system is disengaged and the CWP unit operates with the motor valve 138 fully open to drain. (**AUT/MAN**) shows settings in technical level 2. Refer to paragraph 6.2.2 on page 51.

Selecting **CWP INFO** will show operational information about the system. Use the arrow button to move down through the list.

In display	Unit	Description
FEED WATER	**L/MIN**	Flow rate of inlet water (feed water)
PROD.WATER	**L/MIN**	Flow rate of produced product water
RO REJECT	**L/MIN**	Drain flow (reject) from the RO stage
RETURN FLOW/ HW CIRC	**L/MIN**	Return water flow from the distribution loop or flow of hot water during heating periods.

In display	Unit	Description
CONSUMPTION	**L/MIN**	Product water consumption
COND.IN	**µS/CM**	Inlet water conductivity
COND.OUT	**µS/CM**	Product water conductivity
RECOVERY RATE	**%**	Recovery rate of water in% (portion of inlet water that is converted to product water)
REJECTION RATE	**%**	Rejection of dissolved salts based on conductivity
TEMP.RETURN	**°C**	Temperature in return water from the distribution loop
TEMP TANK	**°C**	Temperature in the HW tank
TANK LEVEL		Shows **EMPTY** if the HW tank is empty.
		Level in HW tank (**FULL/NOT FULL**)

If is pressed and **TECHNICIAN INFO** is selected, the information in the table below will appear in the display.—µ

Use the arrow buttons to move through the list.

In display	Description
LEVEL 2 - CODE XXX	Technician code + ↵ allows access to technician info level 2. Refer to *Service Manual* for more information.
DETAILED DIS-PLAY	The display normally shows the minimum required information. More detailed information can be obtained by moving the cursor to **NO** and pressing ↵. To return to normal reading, move the cursor to **YES** and press ↵. Alternatively, keep STATUS pressed for 5 seconds until display changes. Refer to *Service Manual* for more information about detailed display.
MAX TEMP 1 RETURN	The temperature in the return line at turn off of the last heating period registered under **HIGH TEMP.PERIOD 1** is displayed here. Refer to **TIME CHANNELS** and programming of time channels in *Service Manual* for more information.
MAX TEMP 2 RETURN	The temperature in the return line at turn off of the last heating period registered under **HIGH TEMP.PERIOD 2** is displayed here. Refer to **TIME CHANNELS** and programming of time channels in *Service Manual* for more information.
MAN.HIGH TEMP HW (H-MODELS ONLY)	Heating to 90°C of the water in the tank can be initiated here. Move the cursor to **NO** and press ↵. The entry automatically changes to **YES**. Heating will stop at the next turn off time programmed into any of the time channels **HIGH TEMP.PERIOD**, refer to *Service Manual*. To turn off a manual heating period, move the cursor to **YES** and press ↵.

In display	Description
RUNNING TIME	Running time meter for the CWP unit. It represents the hours in operation of the RO pump in the CWP unit.
FEED WATER	Accumulated consumption of inlet water (feed water) in m^3.
N:O DISINF.	Record of number of chemical disinfection cycles that have been performed.
N:O LEVEL ALARM	Record of total number of instances that the low level switch in the inlet water tank has indicated low level. This value should be recorded regularly if problems with the water supply is suspected. Refer to *Service Manual*.
PROGRAM VERSION	Information about present program version. Press ↵ to display information.
PLC-INFO	Used by MCP technicians only.

6.2.2 Disengage Water Saving

Step 1 Press ⌂.

Step 2 Move the cursor to the free space after **REJECT CONTROL** on line 4 on the display.

Step 3 Enter the operator code and then press ↵ (**>>>>** appears on line 5).

Step 4 Place the cursor at **AUT** and press ↵. The text then changes to **MAN** and the motor valve opens fully to drain.

6.3 Appendix 3 — Log List (Daily Check)

Water treatment system CWP 100, model _____ **serial number** _____

Hospital: _____ **Country:** _____

Month: _____ **Year:** _____

Daily Water Quality Monitoring Log

Date								
Type of test / Monitoring / Limits	**Sun**	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	
Inlet pressure to CWP, MPa / PSI								
Inlet water to CWP, total chlorine level, ppm (mg/l)								
Inlet water to CWP, hardness, mg/L or ppm								
Press **MAIN MENU** + **ENTER**. Record following values:								
Inlet water flow rate, l/min								
Product water flow rate, l/min								
RO reject flow rate, l/min								
Return flow rate from clinic, l/min								
Consumption, l/min								
Inlet water conductivity (cond. in), µS/cm								
Product water conductivity (cond. out), µS/cm								
Recovery rate (water consumption factor), %								
Rejection rate, %								
Start Hot water circulation								
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